

# TRANSPARENCY AND OUTPUT STABILITY: EMPIRICAL EVIDENCE\*

## 1. INTRODUCTION

The stabilizing effect of transparency on inflation volatility is well recognized in the literature (see Cecchetti and Krause, 2002; Dincer and Eichengreen, 2007 and 2010; Demertzis and Hughes Hallett, 2007; Crowe and Meade, 2008). Theoretically also, transparency about policy processes increases macroeconomic stability by making policy more predictable and credible (Faust and Svensson, 2001; Geraats, 2005; Rudebusch and Williams, 2008; Hahn, 2009; Laskar, 2010; Baeriswyl and Cornand, 2011).

However, the general relation of transparency with output volatility is mixed theoretically and not well explored empirically (see van der Cruijssen and Eijffinger, 2008 for a survey). For example, among the few empirical studies on the issue, Demertzis and Hughes Hallett (2007) find, contrary to their theoretical prediction, a positive relation between output volatility and transparency. But Dincer and Eichengreen (2007) find that transparency reduces output volatility. One explanation for these mixed findings is high correlation between transparency indicators and central bank independence (CBI) (Demertzis and Hughes Hallett, 2007). Notably, CBI is found to have no empirical relation with output volatility or is likely to increase it (see Alesina and Summers, 1993; De Haan and Kooi, 2000).

Moreover, there is a possibility that central bank may be better off by being less transparent as ambiguity allows greater discretion to pursue policy goals (Cukierman and Meltzer, 1986; Geraats, 2007; Walsh, 2008). More recently, van der Cruijssen *et al.* (2010) provide robust evidence that intermediate degree of overall transparency is optimal in reducing inflation persistence.

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This paper draws on unique insights about transparency to investigate its link with output volatility controlling for the influence of various other sources. Importantly, focusing on indicators relating to different aspects of policy processes an attempt is made to delineate their individual influences<sup>1</sup>.

In particular this paper attempts to answer the following two questions:

- i. What is the effect of transparency on output volatility in the presence of other sources of output stabilization?
- ii. Do different aspects of transparency differ qualitatively or quantitatively in terms of their effects on output volatility?

These questions have not been properly studied, partly due to lack of comprehensive time varying transparency measures that have become available lately. By focusing on these issues, therefore, this study provides insights of direct policy relevance. For instance, in the light of the current financial crisis many central banks started a series of unconventional monetary policy measures to cope with the crisis. To use these instruments credibly central banks are enhancing information disclosure about policy processes (Bernanke, 2011). For this reason, the link between central bank transparency, its different aspects, and output stability is crucial for policy effectiveness. Therefore, policymakers must be aware of the nature and strength of any tradeoff between greater transparency and macroeconomic volatility if it exists. Similarly, it is an empirical issue that to what extent operational transparency allows central bank flexibility to stabilize economic shocks without destabilizing output and employment (Mishkin, 2004).

While it is also important to see the relevance of central bank transparency in the presence of structural changes that have been identified as the sources of the greater macroeconomic stabilization in recent years (Cecchetti, *et al.*, 2006b; and Ćorić, 2011a).

Using a panel data set of 80 countries over 1998 to 2007 period we find that transparency has a stabilizing influence on output

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<sup>1</sup> Geraats (2002) classifies five dimensions of transparency in terms of policy processes: political, economic, procedural, and operational. Political transparency is about the clarity of objectives, economic transparency covers information used for the policy decision, procedural transparency relates to the decision making process, policy transparency to the monetary policy stance, and operational transparency to the effects of monetary policy implementation.

volatility<sup>2</sup>. Our results do not suffer from the problem of endogeneity and are robust against different specifications that control for the important determinants of output volatility. Digging deeper, we find, among various dimensions of measured transparency, that operational transparency has the greatest relevance for output stabilization; while political transparency is either unrelated to or tends to increase output volatility. We also find that volatility of output reduces with more efficient inventory management, with increasing share of services in GDP, with declining risk of external shocks and increasing credit to private sector.

The rest of the paper is structured as follows. The following section deals with the empirical specification, data, and the results. In section 3 the results are presented on the two questions posed in the Introduction. The final section concludes the study.

## 2. EMPIRICAL SPECIFICATION

Recent empirical literature routinely identifies three broad sources of output stabilization across countries. These are good luck (i.e. exogenous decline in frequency and magnitude of common shocks), structural change, and good policy hypothesis<sup>3</sup>.

In our empirical model we try to control for the influence of all three hypothesis in order to determine their individual impact relative to other factors. The effect of macroeconomic policy is captured both by monetary and fiscal policy indicators. The effect of changes in monetary policy practice is captured by transparency index provided by Siklos (2011). He employs the methodology of Eijffinger and Geraats (2006) to calculate transparency scores for 100 countries over 1998 to 2009 period.

The Eijffinger and Geraats (EG) index measures five dimensions

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<sup>2</sup> The countries included in the sample are listed in the Data Appendix at the end of the paper. We have excluded monetary unions like Euro and union of Central African States to avoid outliers' affects and also because of non-availability of their data on all the variables. Our sample comprises of high income and middle income countries according to World Bank classification. The middle income group in our sample includes World Bank's upper middle income and lower middle income categories.

<sup>3</sup> This literature is often called the Great Moderation and is initially studied for the US by McConell and Perez-Quiroz (2000). Ćorić (2011b) surveys the literature.

of transparency covering all the important aspects related to political, economic, procedural, policy, and operational processes of policy. Each of the five aspects of the EG index has also three sub-indices. Hence, 15 sub-indices compose the general EG index. The minimum score of each sub-index is 0, and the maximum is 1, with higher score corresponding to higher level of transparency. Summing all the 15 sub-indices' scores yields the general EG index. Consequently, the EG index has a minimum of 0, and a maximum of 15.

The economic and operational aspects of EG index are particularly relevant for output stabilization (Faust and Svensson, 2001; Walsh, 2008): the former covers components that define transmission mechanism of the policy like economic data, policy models, and central bank forecasts. And later is based on factors that are unaccounted for by the policy such as control errors, shocks, and evaluation of policy outcomes. While political, procedural and policy indices are more concerned with accountability aspect of policy.

Many authors point out the significance of fiscal policy in output stabilization (e.g., Canova *et al.*, 2007; and Cabanillas and Ruscher, 2008). Fiscal policy can influence the variance of output by discretionary interventions and by automatic stabilizers. We prefer to consider automatic stabilizers given the lesser role that has been assigned to discretionary fiscal policy in recent years. We consider net fiscal lending (or borrowing) as a percentage of national output as an indicator for fiscal policy. It is considered a standard measure of the financial impact of general government activity on the rest of the economy<sup>4</sup>.

In structural variables set we primarily considered, following Cecchetti *et al.* (2006b), changes in the private inventory investment and commercial openness captured by the ratio of trade to GDP. It is find that greater flexibility and timeliness in inventory management stabilizes output (McConnell and Perez-Quiros, 2000). In cross country setting, Cecchetti *et al.* (2006b) and Cabanillas and Ruscher (2008) find that changes in inventory investment are negatively correlated with output volatility.

Greater trade openness can increase or decrease the variance of output. Previous cross sectional studies e.g., Cecchetti *et al.* (2006a),

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<sup>4</sup> See IMF (2001) section 4.17. Another possible indicator for the government's role in the economy is the cyclically adjusted fiscal balance (called government structural balance by the IMF). Our results (available on request) remain (qualitatively) unchanged with structural balance as a fiscal policy indicator.

Dincer and Eichengreen (2007) and Cabanillas and Ruscher (2008) find only a weak positive relation between openness and output volatility. But it is important to control for this variable to account for the increased economic dependence between countries (Stock and Watson, 2003). To verify the sensitivity of our main results we also consider other possible sources of structural change like ratio of credit to private sector, oil intensity of output, and the share of services in national output.

The influence of the exogenous shocks can be controlled in two ways. One can take benefit of the panel data structure and incorporate country heterogeneity and time effects to control, respectively, for idiosyncratic shocks and common external shocks. However, given the inherent inertia in the macroeconomic variables, the use of panel fixed effects may cause bias. Therefore, our strategy is to control common shocks through time effects and for country specific real shocks we use Political Risk Services Group's measure of external conflict. It measures risk that a country faces from war, cross-border conflict and other foreign pressures by assigning higher values to the countries that are facing lesser risk of the external conflict. A change in these factors can alter the state of economic expectations and cause volatility in macroeconomic variables. Therefore, we think it appropriate to consider this measure as a proxy for real shocks. It adds a novel feature to our analysis in comparison with the questionable practice that infers the effects of shocks from the residuals of the estimated model (Giannone *et al.*, 2008).

In econometric terms the above discussion can be summarized as follows:

$$\text{Output Volatility}_{it} = \alpha + \beta [\text{Policy Set}]_{it} + \delta [\text{Structural Change}]_{it} + \zeta [\text{Shocks}]_t + \gamma_i + \varphi [\text{Controls}]_{it} + \varepsilon_{it} \quad (1)$$

where subscript 'i' is for country and 't' denotes year, and  $\alpha$  is the common constant term. *Output Volatility* is the deviation of real output from its trend<sup>5</sup>. Policy set comprises of two vectors, one is the transparency scores and second is the net fiscal lending or borrowing. In *Structural Change* vector we include private inventory changes in the main regressions while include other determinants of output volatility like credit to private sector, share of services in the GDP, and Oil/GDP ratio in turn. The time fixed effects are

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<sup>5</sup> The long term trend is the average level of output over 1970 to 2007 period. For transition economies, the trend is the average from 1991 to 2007.

represented by  $\gamma_i$ . In the *Controls* vector we include inflation<sup>6</sup> and log of real national output.

Finally,  $\varepsilon_{it}$  is the composite error term satisfying the iid assumptions. In our sample  $i$  range from 1 to 80 while  $t$  varies yearly from 1998 to 2007. Table 1 provides summary statistics of the variables used in our analysis.

### 3. RESULTS

Estimation results for different variations of equation (1) using pooled least squares are reported in Tables 2 and 3. As we cannot reject the null hypothesis of cross sectional independence for the residuals of our models we use Driscoll and Kraay (1998) standard errors. In addition to being robust against heteroskedasticity in the error term, Driscoll and Kraay standard errors are also robust against autocorrelation of order greater than 1 in the errors<sup>7</sup>.

The overall fit of the models in both the Tables is decent. The models are highly significant as shown by the joint F-statistic reported in the lower panel of the tables. We have gathered evidence on two questions posed in the literature in Tables 2 and 3 and it is appropriate to discuss the results in turn.

#### 3.1 *Determinants of Output Volatility: Transparency Versus other Factors*

Table 2 estimates the impact of transparency on output volatility in the presence of various factors that have been found pro-stabilizing in the literature. Our results show that transparency has a significant negative effect on output volatility in all the five models in Table 2. In terms of *ceteris paribus* elasticity this effect hovers around a moderate value of -0.31 in different models in Table 2.

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<sup>6</sup> Following Cukierman *et al.* (1992) we have transformed inflation as  $\pi/(1+\pi)$  to avoid outliers influence, where  $\pi$  is annual rate of price change. It reduces heteroskedasticity (and is also preferable from a theoretical perspective, since it has an intuitive derivation, namely the inflation tax paid on unremunerated money balances or other nominal assets).

<sup>7</sup> All the estimations are performed on STATA using its panel data routine – XTSCC – designed for Driscoll and Kraay standard errors. The reported results assume an autocorrelation of order 3 in the error term.

This result partly supports the argument of Bernanke (2004) that improved and predictable monetary policy played an important role in the macroeconomic stabilization experienced by a large number of countries.

However, we do not find any significant impact of fiscal policy indicator (i.e. government borrowing/lending) on the output stability. It is significant only in Column (3) at 10 percent level. This may reflect the lesser role that has been assigned to fiscal policy in recent years in macroeconomic management.

Among structural causes of stabilization, inventory change has a consistent negative effect. Interpreting as elasticity, it equals to a value of 0.13 which is not very elastic. It implies that better inventory management can stabilize output but its effect at aggregate level is not particularly high.

In line with previous evidence, we find positive effect of openness on output stability (see Cecchetti *et al.*, 2006a; Dincer and Eichengreen, 2007; and Cabanillas and Ruscher, 2008). We estimate a relatively inelastic effect of increase in openness. Precisely, we find a 0.15 percent increase in output volatility due to a one percent increase in openness. It implies that increase in output volatility due to openness does not create excessive volatility.

Regarding control variables, inflation remains largely insignificant in our model except in Column (2) where its coefficient is negatively significant at 5 percent. It supports the theoretical finding that there is a tradeoff between output stabilization and inflation stabilization. The other control variable, log of real GDP, has a consistent and positive effect on output volatility with an elasticity of around 0.20 which is not particularly large. It implies that an increase in *per capita* income, *ceteris paribus*, increases the fluctuations of output around its trend.

Among other variables we find that a one percent increase in credit to private sector will reduce output volatility by 0.08 percent which is an inelastic response. While our results support the hypothesis that greater share of services sector stabilizes the economy. In terms of elasticity, our estimates indicate that a one percent increase in the share of services in the national income decreases the output variance by 0.48 percent. This result also helps explain the insignificance of Oil to GDP ratio in our results as greater value addition by services sector will tend to decrease the oil elasticity of output.

Similarly, our results show that a decreased risk of external shocks increases output stability. This finding partially supports the

good luck hypothesis which states that decline in external shocks have caused output stability (e.g., Blanchard and Simon, 2001; Stock and Watson, 2003; and Chang-Jin *et al.*, 2008). In terms of elasticity, the *ceteris paribus* effect of external shocks is greater than transparency: a one percent decrease in external risk decreases output volatility by 0.86 percent.

Our results in Table 2 indicate that transparent monetary policy has a stabilizing effect on output. However, other factors, namely, share of services in GDP, inventory change, and decrease in external shocks all have significant effect on output volatility. In terms of comparison, largest affect is by external shocks and then transparency<sup>8</sup>. The main focus of our analysis is on the influence of transparency which is robust against alternative specifications and is significant economically and statistically. However, it remains to be seen whether some aspects of transparency are more or less pertinent for output stabilization.

### *3.2 Determinants of Output Volatility: Different Dimensions of Transparency*

Transparency is measured over different dimensions of the policy processes. As mentioned in the previous section, some of these processes pertain to transmission mechanism of the policy and thus are likely to have a stronger impact on output volatility. While others are likely to have qualitatively different impact on output volatility. To see these issues precisely we estimate using five dimensions of EG index individually but simultaneously in each of the specification of Table 2. Results are shown in Table 3. Whereas, to facilitate comparison, Table 4 provides corresponding elasticity estimates of each of the regressors in Table 3. The largest stabilizing impact among various dimensions of transparency is by operational transparency. It concerns control errors, unanticipated disturbances, and evaluation of the policy outcomes. According to our estimates in Model (11) a one percent *ceteris paribus* increase in operational transparency will cause 0.20 per cent decrease in output

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<sup>8</sup> An interesting question for future research is to see how robust is the effect of external shocks on macroeconomic stabilization. In particular, to investigate its robustness against different measurements of shocks. These questions are outside the scope of this study.

volatility. The corresponding values for procedural transparency and policy transparency are 0.06 and 0.11 respectively. Whereas economic transparency has no significant effect on output volatility and though political transparency has positive effect it is not robust against alternative specifications. Notably, in the cases where political transparency is significant, the combined stabilizing effect of procedural, policy, and operational transparency is greater than the destabilizing effect of political transparency implying a net economic benefit of transparency.

Among other variables, inventory change has a consistent negative effect on output volatility. In particular, a one percent increase in the value of inventory change will reduce output volatility by 0.14 percent in our Model (11). This result supports the studies arguing that greater flexibility and improvement in the inventory management stabilizes output (e.g., Cecchetti *et al.*, 2006b; Cabanillas and Ruscher, 2008; and Davis and Kahn, 2008).

Our results show that greater openness increases output volatility. Arguably, greater openness increases the economies' exposure to outside risks and thus increases volatility. This result is in line with the earlier empirical findings of Cecchetti *et al.* (2006b), Dincer and Eichengreen (2007) and Cabanillas and Ruscher (2008).

#### 4. CONCLUDING REMARKS

Empirical studies on transparency mostly consider its effects on inflation and inflation expectations. The few studies that focus on its link with output volatility come out with mixed findings. Using a panel data set of 80 developed and developing countries over 1998 to 2007 period, this paper studies the effect of transparency on output volatility. Two key questions that it addresses are:

- i. What is the effect of transparency on output volatility in the presence of other sources of output stabilization?

Results show that transparency has a stabilizing effect on output volatility. However, other causes of stability, namely, greater flexibility in inventory changes, share of services in GDP, and credit to private sector are also significant. As there is some evidence in the literature that transparency increases output volatility we attempt to differentiate the impact elasticity of various dimensions of transparency. Thus, the second question addressed by this study is the following:

- ii. Do different aspects of transparency differ qualitatively or quantitatively in terms of their effects on output volatility?

We find in line with theoretical conjectures that operational component of transparency has largest stabilizing effect on output; the impact of procedural and policy aspects is also stabilizing though less strong. On the other hand, economic transparency is not significant at all while political transparency is mostly insignificant or tends to increase output volatility. The positive relation between political transparency and output volatility is in line with the theoretical prediction that making central banks independent from the government's influence may increase output volatility (Rogoff, 1985; Cukierman, 2002).

From a policy angle, our findings emphasize the importance of transparency particularly the disclosure of information on policy, procedural, and operational aspects. The stabilizing effect of operational transparency, which covers information disclosure about control errors, shocks, and target evaluations, is supporting the theoretical prediction of Faust and Svensson (2001) and Laskar (2010) that transparency about control errors and shocks allow the public to infer central bank's preferences more accurately. Although the net estimated effect of transparency on output is stabilizing in our results, what remains to be seen is the simultaneous effect of transparency on output and inflation volatility. It is an open question for future research.

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## REFERENCES

- Alesina, A. and L.H. Summers (1993), "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence", *Journal of Money, Credit and Banking*, 25(2), 151-162.
- Baeriswyl, R. and C. Cornand (2011), "Transparency and Monetary Policy Effectiveness", *Annals of Economics and Statistics*, 103-104, 165-184.
- Bernanke, B.S. (2004), The Great Moderation, Speech at the Meeting of the Eastern Economic Association, Washington, DC, 20 February. <<http://www.federalreserve.gov/boarddocs/speeches/2004/20040220/default.htm>>, accessed 10 January 2012.
- Bernanke, B.S. (2011), The Effects of the Great Recession on Central Bank Doctrine and Practice, Remarks at the 56<sup>th</sup> Economic Conference Federal Reserve Bank of Boston, Massachusetts, 18 October, <<http://www.federalreserve.gov/newsevents/speech/bernanke20111018a.htm>>, accessed 19 January 2012.
- Blanchard, O. and J. Simon (2001), "The Long and Large Decline in US Output Volatility", *Brookings Papers on Economic Activity*, 32(1), 135-174.
- Cabanillas, L.G. and E. Ruscher (2008), "The Great Moderation in the Euro Area: What Role Had Macroeconomic Policies Played?", European Commission Economic Papers No. 331, <[http://ec.europa.eu/economy\\_finance/publications/publication12753\\_en.pdf](http://ec.europa.eu/economy_finance/publications/publication12753_en.pdf)>, accessed 19 January 2012.
- Canova, F., L. Gambetti and E. Pappa (2007), "The Structural Dynamics of Output Growth and Inflation: Some International Evidence", *Economic Journal*, 117(519), C167-C191.
- Cecchetti, S.G., A. Flores-Lagunes and S. Krause (2006a), "Has Monetary Policy become More Efficient? A Cross-country Analysis", *Economic Journal*, 116(511), 408-433.
- Cecchetti, S.G., A. Flores-Lagunes and S. Krause (2006b), "Assessing the Sources of Changes in the Volatility of Real Growth", NBER Working Paper No. 11946.
- Cecchetti, S.G. and S. Krause (2002), "Central Bank Structure, Policy Efficiency and Macroeconomic Performance: Exploring Empirical Relationships", *Federal Reserve Bank St Louis Review*, 84(4), 47-60.
- Chang-Jin, K., J. Morley and J. Piger (2008), "Bayesian Counterfactual Analysis of the Sources of the Great Moderation", *Journal of Applied Econometrics*, 23(2), 173-191.
- Ćorić, B. (2011a), "The Global Extent of the Great Moderation", *Oxford Bulletin of Economics and Statistics*, 74(4), 493-509.
- Ćorić, B. (2011b), "The Sources of the Great Moderation: A Survey", Available at SSRN: <<http://ssrn.com/abstract=1641201>>, accessed 20 November 2011.
- Crowe, C. and E.E. Meade (2008), "Central Bank Independence and Transparency: Evolution and Effectiveness", IMF Working Paper WP/08/119.

- Cukierman, A. (2002), "Are Contemporary Central Banks Transparent about Economic Models and Objectives and what Difference does it Make?", *Federal Reserve Bank St Louis Review*, 84(4), 15-36.
- Cukierman, A. and A. Meltzer (1986), "A Theory of Ambiguity, Credibility and Inflation under Discretion and Asymmetric Information", *Econometrica*, 54(5), 1099-1128.
- Cukierman, A., S. Webb and B. Neyapti (1992), "Measuring the Independence of Central Banks and its Effect on Policy Outcomes", *World Bank Economic Review*, 6(3), 353-398.
- Davis, J.S. and J.A. Kahn (2008), "Interpreting the Great Moderation: Changes in the Volatility of Economic Activity at the Micro and Macro Levels", *Journal of Economic Perspectives*, 22(4), 155-180.
- De Haan, J. and W.J. Kooi (2000), "Does Central Bank Independence Really Matters? New Evidence for Developing Countries Using a New Indicator", *Journal of Banking Finance*, 24(4), 643-664.
- Demertzis, M. and A. Hughes Hallett (2007), "Central Bank Transparency in Theory and Practice", *Journal of Macroeconomics*, 29(4), 760-789.
- Dincer, N. and B. Eichengreen (2007), "Central Bank Transparency: Where, Why and with What Effect?", NBER Working Paper No. 13003.
- Dincer, N. and B. Eichengreen (2010), "Central Bank Transparency: Causes, Consequences and Updates", *Theoretical Enquiries in Law*, 11(1), 75-123.
- Driscoll, J. and A.C. Kraay (1998), "Consistent Covariance Matrix Estimation with Spatially Dependent Data", *Review of Economic Statistics*, 80(4), 549-560.
- Eijffinger, S.C.W. and P.M. Geraats (2006), "How Transparent are Central Banks?", *European Journal of Political Economy*, 22(1), 1-21.
- Faust, J. and L.E.O. Svensson (2001), "Transparency and Credibility: Monetary Policy with Unobserved Goals", *International Economic Review*, 42(2), 369-397.
- Geraats, P.M. (2002), "Central Bank Transparency", *Economic Journal*, 112(483), F532-F565.
- Geraats, P.M. (2005), "Transparency and Reputation: The Publication of Central Bank Forecasts", *Topics in Macroeconomics*, 5(1), 1-26.
- Geraats, P.M. (2007), "The Mystique of Central Bank Speak", *International Journal of Central Banking*, 3(1), 37-80.
- Giannone, D., M. Lenza and L. Reichlin (2008), "Explaining the Great Moderation it is not the Shocks", *Journal of the European Economic Association*, 6(2-3), 621-633.
- Hahn, V. (2009), "Transparency of Central Bank Preferences", *German Economic Review*, 10(1), 32-49.
- IMF (2001), Government Finance Statistics Manual 2001, International Monetary Fund: Washington DC, <<http://www.imf.org/external/pubs/ft/gfs/manual/index.htm>>. Accessed 11 June 2011>.

- IMF (2011), World Economic Outlook data base, <<http://www.imf.org/external/pubs/ft/weo/2011/01/>>.
- Laskar, D. (2010), "Central Bank Transparency and Shocks", *Economic Letters* 107(2), 158-160.
- McConell, M.M. and G. Perez-Quiroz (2000), "Output Fluctuations in the United States: What Has Changed since the Early 1980's", *American Economic Review*, 90(5), 1464-1476.
- Mishkin, F.S. (2004), "Can Central Bank Transparency Go too Far?", NBER Working Paper No. 10829.
- Political Risk Services, International Country Risk Guide, <<http://www.prsgroup.com/ICRG.aspx>>.
- PWT (2011), A. Heston, R. Summers and B. Aten, Penn World Table Version 7.0, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, June.
- Rogoff, K. (1985), "The Optimal Degree of Commitment to a Monetary Target", *Quarterly Journal of Economics*, 100(4), 1169-1190.
- Rudebusch, G. and J. Williams (2008), *Revealing the Secrets of The Temple: The Value of Publishing Central Bank Interest Rate Projections*, in: J.Y. Campbell (Ed.), "Asset Prices and Monetary Policy", University of Chicago Press: Chicago.
- Siklos, P.L. (2011), "Central Bank Transparency: Another Look", *Applied Economic Letters*, 18(10), 929-933.
- Stock, J.H. and M.W. Watson (2003), "Understanding Changes in International Business Cycle Dynamics", NBER Working Paper No. 9859.
- UN Data, <<http://data.un.org/Explorer.aspx>>.
- van der Cruysen, C.A.B. and S.C.W. Eijffinger (2008), "The Economic Impact of Central Bank Transparency: A Survey", CEPR Discussion Paper No. 6070.
- van der Cruysen, C.A.B., S.C.W. Eijffinger and L. Hoogduin (2010), "Optimal Central Bank Transparency", *Journal of International Money and Finance*, 29(8), 1482-1507.
- Walsh, C.E. (2008), "Announcement and the Role of Policy Guidance", *Federal Reserve Bank St Louis Review*, 90(4), 421-442.
- WDI (2011), World Development Indicators, April, <<http://data.worldbank.org/data-catalog/world-development-indicators/wdi-2011>>.

## ABSTRACT

This paper focuses on the empirical link between monetary policy transparency and output volatility. Key questions addressed are: (i) Does transparency about policy processes stabilize output? (ii) Whether different aspects of transparency differ qualitatively or quantitatively in terms of their effects on output volatility? Controlling for many standard structural sources of output stability, and using a data set of 80 countries over 1998 to 2007 period, our results show that transparency has a stabilizing influence on output volatility. However, compared to other structural sources of stabilization it has lesser influence on output volatility. Further, within different dimensions of transparency we find that operational transparency has the largest effect on output. Whereas political transparency tends to increase it, the other components have insignificant or negligible influence on output volatility.

Keywords: Monetary Policy Transparency, Central Bank Independence, Transparency Index, Output Stabilization

JEL Classification: C33, C36, E63

## RIASSUNTO

### *Trasparenza e stabilità della produzione: evidenze empiriche*

Questo studio è incentrato sulla relazione empirica tra la trasparenza nella politica monetaria e la volatilità nel livello di produzione. I principali interrogativi affrontati sono: 1) la trasparenza nella politica monetaria stabilizza il livello di produzione? 2) i diversi tipi di trasparenza differiscono qualitativamente o quantitativamente in termini di influenza sulla volatilità della produzione?

Analizzando molte fonti strutturali standard di stabilità di produzione e usando un dataset di 80 paesi tra il 1998 e il 2007, la nostra ricerca mostra che la trasparenza ha un'influenza stabilizzante sulla volatilità della produzione. Tuttavia risulta che tale influenza sulla volatilità è inferiore a quella esercitata dagli altri fattori strutturali considerati in questo lavoro. Inoltre, considerando i diversi tipi di trasparenza, quella che causa l'effetto più ampio sulla produzione risulta essere quella operativa. Mentre la trasparenza politica tende ad aumentare la volatilità della produzione, le altre componenti hanno influenza non significativa o negativa su di essa.

## APPENDIX I – TABLES

TABLE 1 - *Variable Definitions, Summary Statistics and Data Sources*

| Variable         | Definition (mean; standard deviation)                                                                                                                                                                                                                                                                                                                                  | Source                                                                                                                                       |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <i>OutputVol</i> | Deviation of the log of real GDP (measured as total value added in constant 2005 US dollars) from log of its trend. Where trend is the average of its values from 1970 to 2007 (for transition economies it is the average from 1991 to 2007) (0.426; 0.73)                                                                                                            | UN Data <a href="http://data.un.org/Explorer.aspx">http://data.un.org/Explorer.aspx</a>                                                      |
| <i>TI</i>        | An overall index of transparency comprises of political, economic, procedural, policy, and operational aspects of transparency (5.496; 3.03)                                                                                                                                                                                                                           | Eijffinger and Geraats (2006) transparency index as provided by Siklos (2011)                                                                |
| <i>PolitTI</i>   | Political Transparency concerns statement of policy objectives and explicit institutional arrangement (6.517; 0.76)                                                                                                                                                                                                                                                    | Eijffinger and Geraats (2006) transparency index as provided by Siklos (2011)                                                                |
| <i>EconTI</i>    | Economic Transparency includes information (like economic data, economic model, and forecasts) that central banks use in policy decisions (2.819; 1.69)                                                                                                                                                                                                                | Eijffinger and Geraats (2006) transparency index as provided by Siklos (2011)                                                                |
| <i>ProcedTI</i>  | Procedural Transparency is about policy strategy, and account of policy deliberations (2.269; 1.51)                                                                                                                                                                                                                                                                    | Eijffinger and Geraats (2006) transparency index as provided by Siklos (2011)                                                                |
| <i>PolicyTI</i>  | Policy Transparency contains explanation of the policy decision and policy future inclination (2.405; 1.67)                                                                                                                                                                                                                                                            | Eijffinger and Geraats (2006) transparency index as provided by Siklos (2011)                                                                |
| <i>OperTI</i>    | Operational Transparency pertains to control errors in achieving policy targets and shocks that affect the transmission of monetary policy (2.529; 1.42)                                                                                                                                                                                                               | Eijffinger and Geraats (2006) transparency index as provided by Siklos (2011)                                                                |
| <i>BudBal</i>    | Total revenue minus total expenditure of the Federal Government as percent of GDP (0.956; 1.16 )                                                                                                                                                                                                                                                                       | IMF (2011)                                                                                                                                   |
| <i>Openness</i>  | Ratio of imports plus exports to GDP (95.081; 57.37)                                                                                                                                                                                                                                                                                                                   | PWT (2011)                                                                                                                                   |
| <i>Inflation</i> | Annual percentage change in Consumer Price Index (0.769; 1.25)                                                                                                                                                                                                                                                                                                         | IMF (2011)                                                                                                                                   |
| <i>LogGDP</i>    | It is measured as total value added in constant 2005 US dollars (24.660; 2.08)                                                                                                                                                                                                                                                                                         | UN Data <a href="http://data.un.org/Explorer.aspx">http://data.un.org/Explorer.aspx</a>                                                      |
| <i>CredPvt</i>   | It refers to financial resources provided to the private sector, such as through loans, purchases of non equity securities, and trade credits and other accounts receivable that establish a claim for repayment (60.561; 51.74)                                                                                                                                       | WDI (2011)                                                                                                                                   |
| <i>InvChg</i>    | It is the value of the change in inventories (measured in constant 2005 US dollars) (19.783; 2.43)                                                                                                                                                                                                                                                                     | UN Data <a href="http://data.un.org/Explorer.aspx">http://data.un.org/Explorer.aspx</a>                                                      |
| <i>GDP/Oil</i>   | GDP per unit of energy use is the GDP per kilogram of oil equivalent of energy use. Where GDP is measured in 2005 constant purchasing power parity dollars (6.658; 8.79)                                                                                                                                                                                               | WDI (2011)                                                                                                                                   |
| <i>ServShare</i> | Percentage value addition by services sector in GDP of a country (58.282; 12.72)                                                                                                                                                                                                                                                                                       | WDI (2011)                                                                                                                                   |
| <i>Extconf</i>   | It is an assessment of the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc) to violent external pressure (cross-border conflicts to all-out wars). High scores indicate low value of external risk (10.347; 1.24) | Political Risk Services, International Country Risk Guide, <a href="http://www.prsgroup.com/ICRG.aspx">http://www.prsgroup.com/ICRG.aspx</a> |

## COUNTRY SAMPLE

## HIGH INCOME COUNTRIES (WORLD BANK CLASSIFICATION) (33)

Australia Bahamas Bahrain Barbados Canada Croatia Cyprus  
Czech Republic Denmark Estonia Hong Kong Hungary Iceland  
Israel Japan Korea Kuwait Malta New Zealand Norway Oman  
Poland Qatar Saudi Arabia Singapore Slovakia Slovenia Sweden  
Switzerland Trinidad Tobago UAE UK USA

## MIDDLE INCOME COUNTRIES (WORLD BANK CLASSIFICATION) (47)

Albania Argentina Armenia Belarus Belize Bhutan Brazil  
Bulgaria Chile China Colombia Egypt El Salvador Fiji Georgia  
Ghana Guatemala India Indonesia Jamaica Jordan Kazakhstan  
Latvia Lesotho Libya Lithuania Malaysia Mauritius Mexico  
Moldova Mongolia Namibia Nigeria Pakistan Papua New Guinea  
Peru Philippines Romania Russia Solomon Islands South Africa Sri  
Lanka Thailand Tunisia Turkey Ukraine Uruguay

TABLE 2 - *Transparency and Output Volatility: Pooled Least Squares*  
*Dependent Variable: Log Output Volatility*

|                                    | (1)                  | (2)                  | (3)                  | (4)                  | (5)                  |
|------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>TI</i>                          | -0.056***<br>(0.002) | -0.037***<br>(0.002) | -0.056***<br>(0.002) | -0.045***<br>(0.001) | -0.060***<br>(0.003) |
| <i>BudBal</i>                      | 0.025<br>(0.028)     | 0.023<br>(0.022)     | 0.046*<br>(0.027)    | 0.017<br>(0.027)     | 0.022<br>(0.031)     |
| <i>InvChg</i>                      | -0.135***<br>(0.008) |                      | -0.138***<br>(0.010) | -0.143***<br>(0.008) | -0.135***<br>(0.012) |
| <i>Openness</i>                    | 0.002***<br>(0.000)  | 0.002***<br>(0.000)  |                      | 0.002***<br>(0.000)  | 0.001***<br>(0.000)  |
| <i>Inflation</i>                   | -0.002<br>(0.005)    | -0.009**<br>(0.004)  | 0.001<br>(0.004)     | -0.002<br>(0.006)    | 0.001<br>(0.007)     |
| <i>LogGDP</i>                      | 0.233***<br>(0.010)  | 0.116***<br>(0.006)  | 0.247***<br>(0.018)  | 0.243***<br>(0.014)  | 0.267***<br>(0.013)  |
| <i>CredPvt</i>                     |                      | -0.001***<br>(0.000) |                      |                      |                      |
| <i>GDP/Oil</i>                     |                      |                      | -0.001<br>(0.001)    |                      |                      |
| <i>ServShare</i>                   |                      |                      |                      | -0.008***<br>(0.002) |                      |
| <i>ExtConf</i>                     |                      |                      |                      |                      | -0.084***<br>(0.009) |
| Time Effects                       | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  |
| Observations                       | 741                  | 764                  | 606                  | 694                  | 661                  |
| R-squared                          | 0.194                | 0.119                | 0.191                | 0.215                | 0.220                |
| Number of countries                | 80                   | 82                   | 79                   | 77                   | 72                   |
| Joint F-statistic                  | 17635.1***           | 12581.1***           | 11249.3***           | 90579.7***           | 37602.2***           |
| Endogeneity test<br>(Chi-sq value) | 0.151                | 1.654                | 1.155                | 1.733                | 0.621                |

Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Constant is included but not reported. The estimation results are from XTSCC procedure using STATA version 11.

TABLE 3 - *Output Volatility and Different Dimensions of Transparency: Pooled Least Squares.*  
*Dependent Variable: Log Output Volatility*

|                     | (6)                  | (7)                  | (8)                  | (9)                  | (10)                 |
|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>PolitTI</i>      | -0.019<br>(0.024)    | -0.034<br>(0.027)    | 0.051***<br>(0.013)  | -0.013<br>(0.019)    | 0.065***<br>(0.024)  |
| <i>EconTI</i>       | 0.003<br>(0.022)     | 0.006<br>(0.029)     | 0.022<br>(0.022)     | 0.003<br>(0.019)     | 0.010<br>(0.031)     |
| <i>ProcedTI</i>     | -0.028***<br>(0.010) | -0.015<br>(0.011)    | -0.038***<br>(0.010) | -0.012*<br>(0.007)   | -0.041**<br>(0.018)  |
| <i>PolicyTI</i>     | -0.047***<br>(0.005) | -0.043***<br>(0.007) | -0.049***<br>(0.008) | -0.041***<br>(0.004) | -0.059***<br>(0.012) |
| <i>OperTI</i>       | -0.080***<br>(0.006) | -0.048***<br>(0.009) | -0.104***<br>(0.006) | -0.084***<br>(0.006) | -0.095***<br>(0.006) |
| <i>BudBal</i>       | 0.032<br>(0.028)     | 0.027<br>(0.024)     | 0.055**<br>(0.027)   | 0.023<br>(0.026)     | 0.032<br>(0.032)     |
| <i>InvChg</i>       | -0.141***<br>(0.008) |                      | -0.147***<br>(0.010) | -0.150***<br>(0.009) | -0.141***<br>(0.011) |
| <i>Openness</i>     | 0.002***<br>(0.000)  | 0.002***<br>(0.000)  |                      | 0.002***<br>(0.000)  | 0.001***<br>(0.000)  |
| <i>Inflation</i>    | -0.004<br>(0.004)    | -0.009**<br>(0.004)  | -0.004<br>(0.004)    | -0.004<br>(0.004)    | -0.005<br>(0.005)    |
| <i>LogGDP</i>       | 0.243***<br>(0.010)  | 0.117***<br>(0.004)  | 0.268***<br>(0.019)  | 0.252***<br>(0.013)  | 0.298***<br>(0.012)  |
| <i>CredPvt</i>      |                      | -0.001***<br>(0.000) |                      |                      |                      |
| <i>GDP/OIL</i>      |                      |                      | -0.001<br>(0.001)    |                      |                      |
| <i>ServShare</i>    |                      |                      |                      | -0.008***<br>(0.002) |                      |
| <i>ExtConf</i>      |                      |                      |                      |                      | 0.084***<br>(0.011)  |
| Time Effects        | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  |
| Observations        | 741                  | 764                  | 606                  | 694                  | 661                  |
| R-squared           | 0.210                | 0.127                | 0.219                | 0.231                | 0.250                |
| Number of countries | 80                   | 80                   | 79                   | 77                   | 72                   |
| Joint F-statistic   | 36081.2***           | 78148.2***           | 771.8***             | 12053.4***           | 5697.6***            |

Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Constant is included but not reported. The estimation results are from XTSCC procedure using STATA version 11.

TABLE 4 - *Elasticities Corresponding to Estimates in Table 3*

|                  | (11)                 | (12)                 | (13)                 | (14)                 | (15)                 |
|------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>PolitTI</i>   | -0.122<br>(0.155)    | -0.219<br>(0.173)    | 0.332***<br>(0.082)  | -0.087<br>(0.125)    | 0.427***<br>(0.158)  |
| <i>EconTI</i>    | 0.008<br>(0.061)     | 0.017<br>(0.079)     | 0.065<br>(0.064)     | 0.009<br>(0.054)     | 0.028<br>(0.090)     |
| <i>ProcedTI</i>  | -0.063***<br>(0.023) | -0.035<br>(0.024)    | -0.087***<br>(0.023) | -0.028*<br>(0.016)   | -0.097**<br>(0.043)  |
| <i>PolicyTI</i>  | -0.114***<br>(0.012) | -0.101***<br>(0.015) | -0.120***<br>(0.019) | -0.102***<br>(0.009) | -0.145***<br>(0.030) |
| <i>OperTI</i>    | -0.203***<br>(0.015) | -0.118***<br>(0.021) | -0.263***<br>(0.016) | -0.215***<br>(0.014) | -0.242***<br>(0.015) |
| <i>BudBal</i>    | 0.032<br>(0.027)     | 0.027<br>(0.024)     | 0.055**<br>(0.027)   | 0.023<br>(0.026)     | 0.032<br>(0.032)     |
| <i>InvChg</i>    | -0.141***<br>(0.007) |                      | -0.147***<br>(0.010) | -0.150***<br>(0.008) | -0.141***<br>(0.011) |
| <i>Openness</i>  | 0.151***<br>(0.162)  | 0.170***<br>(0.014)  |                      | 0.175***<br>(0.017)  | 0.124***<br>(0.012)  |
| <i>Inflation</i> | -0.003<br>(0.003)    | -0.007**<br>(0.003)  | -0.003<br>(0.003)    | -0.003<br>(0.003)    | -0.004<br>(0.004)    |
| <i>LogGDP</i>    | 0.243***<br>(0.009)  | 0.117***<br>(0.004)  | 0.268***<br>(0.019)  | 0.253***<br>(0.013)  | 0.298***<br>(0.012)  |
| <i>CredPvt</i>   |                      | -0.067***<br>(0.021) |                      |                      |                      |
| <i>GDP/OIL</i>   |                      |                      | -0.004<br>(0.006)    |                      |                      |
| <i>ServShare</i> |                      |                      |                      | -0.456***<br>(0.106) |                      |
| <i>ExtConf</i>   |                      |                      |                      |                      | -0.871***<br>(0.111) |

Delta Method Standard Errors in parenthesis; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Elasticities are computed using routine "Margins" in STATA version 11.